

MALLOPHAGA OF WILD MAMMALS OF INDIANA¹John O. Whitaker, Jr., Rebecca J. Goff²

ABSTRACT: Biting lice, Mallophaga, on wild mammals of Indiana were found as follows: *Geomydoecus illinoiensis* on *Geomys bursarius*, *Suricatoecus quadraticeps* on *Urocyon cinereoargenteus*, *Trichodectes octomaculatus* on *Procyon lotor*, *Stachiella kingi* on *Mustela nivalis*, *S. larseni* on *Mustela vison*, *Neotrichodectes minutus* on *Mustela frenata*, *Neotrichodectes interruptofasciatus* on *Taxidea taxus*, *Neotrichodectes mephitidis* on *Mephitis mephitis*, and *Tricholipeurus parallelus* and *T. lipeuroides* on *Odocoileus virginiana*. Not found to date were *Suricatoecus vulpis* (which could be synonymous with *S. quadraticeps*) from *Vulpes vulpes*, *Heterodoxus spiniger* and *Trichodectes canis* from *Canis latrans*, and *Felicola felis* from *Lynx rufus*.

There are very few reports of biting lice, Mallophaga, from wild mammals of Indiana, although biting lice are very host specific and thus one is able to predict quite accurately the species one would expect to find. We know of only three previous reports of Mallophaga on Indiana mammals. Tuszynski and Whitaker (1972) and Malecki (unpublished thesis) reported *Geomydoecus geomydis* (Osborn, 1891) from the Pocket gopher, *Geomys bursarius*. However, this louse has now been reidentified as *G. illinoiensis* Price and Emerson, 1971. Wilson (1957) reported *Trichodectes mephitidis* on *Mephitis mephitis* from Wayne County, Indiana.

During studies on the mammals of Indiana (Mumford and Whitaker, in preparation), a large number of most of the species of wild mammals of Indiana have been examined for ectoparasites.

The purpose of the present paper is to report on the biting lice, Mallophaga, found during these studies.

MATERIALS AND METHODS

Mammals for these studies have been captured in various ways. Some have been shot or trapped, road kills have been extensively examined, while other animals have been donated to us from citizens of Indiana. Animals for study were generally placed in plastic bags as soon as possible after capture, and often were frozen until they could be examined.

Mainly we have used direct observation of mammals, using dissecting needles to probe while viewing the fur and skin of the mammals under 10 to 70 power of a dissecting microscope. Our second major method was by wash-

¹ Received October 18, 1978.

² Department of Life Sciences, Indiana State University, Terre Haute, Indiana 47809.

ing mammals in a detergent solution, and a few mammals were processed by dissolving techniques.

Mallophagans were identified by the senior author and a few representative specimens were sent to Dr. K.C. Emerson (2704 North Kensington Street, Arlington, VA 22207) for verification. Without his help this study would not have been possible.

RESULTS

For this report only those animals harboring biting lice, or for which the species regularly harbors biting lice, are included (Table 1). A total of nine species of mammals were found to harbor biting lice, each having one species of louse, except the White-tailed deer, which harbored two.

Thus a total of 10 species of biting lice were found on wild mammalian hosts in Indiana. Of these, the pocket gopher was a rodent, and the deer was an artiodactyl. The rest were in the order Carnivora. No bobcats, *Lynx rufus*, were examined. Only two species, the red fox, *Vulpes vulpes* (14 examined), and the Coyote (4 examined), did not harbor mallophagans, of the mammals examined from the order Carnivora. Mallophagans would be expected on both of these species if enough individuals were examined, *Heterodoxus spiniger* (Enderlein) and *Trichodectes canis* (deGeer) on the coyote, *Felicolor felis* (Werneck) on the bobcat. *Suricatoecus vulpis* (Denny, 1842) would be expected on *Vulpes*, although there is a question as to whether the species on *Vulpes vulpes* in North America might be *S. quadraticeps* of *Urocyon* (Emerson, 1972). All other carnivores known to exist at present in Indiana harbored biting lice.

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Table 1. Mallophaga from wild mammals of Indiana.

Hosts and Parasites	Number of lice		Hosts with parasite	
	Total	Average	Number	Percent
<i>Geomys bursarius</i> . Pocket Gopher (85 examined)				
<i>Geomydoecus illinoiensis</i> Price and Emerson 1971	1817	21.4	85	100.0
<i>Canis latrans</i> . Coyote (4 examined, no lice found)				
<i>Vulpes vulpes</i> . Red fox (14 examined, no lice found)				
<i>Urocyon cinereoargenteus</i> . Gray fox (42 examined)				
<i>Suricatoecus quadraticeps</i> (Chapman, 1897)	167	4.0	10	23.8
<i>Procyon lotor</i> . Raccoon (54 examined)				
<i>Trichodectes octomaculatus</i> Paine, 1912	1609	29.8	29	53.7
<i>Mustela nivalis</i> . Least Weasel (8 examined)				
<i>Stachiella kingi</i> (McGregor, 1817)	466	58.3	4	50.0
<i>Mustela vison</i> . Mink (9 examined)				
<i>Stachiella larseni</i> Emerson, 1962	49	5.4	4	44.4
<i>Mustela frenata</i> . Long-tailed weasel (15 examined)				
<i>Neotrichodectes minutus</i> (Paine, 1912)	18	2.0	4	26.7
<i>Taxidea taxus</i> . Badger				
<i>Neotrichodectes interrupto-fasciatus</i> (Kellogg and Ferris, 1915)	4	0.6	2	28.6
<i>Mephitis mephitis</i> . Striped skunk (10 examined)				
<i>Neotrichodectes mephitidis</i> (Packard, 1972)	3335	333.5	7	70.0
<i>Lynx rufus</i> (none examined)				
<i>Odocoileus virginiana</i> . White-tailed deer (3 examined)				
<i>Tricholipeurus parallelus</i> Osborne, 1896)	39	13.0	3	100.0
<i>T. lipeuroides</i> (Megnin, 1884)	2	0.7	1	33.3

THE MALE OF *BAETIS MACDUNNOUGHII* IDE AND NOTES ON PARTHENOGENETIC POPULATIONS WITHIN *BAETIS* (EPHEMEROPTERA:BAETIDAE)^{1, 2}

W.P. McCafferty³, D.K. Morihara⁴

ABSTRACT: The discovery of males of *Baetis macdunnoughi* Ide in Indiana and Illinois indicates that the species is parthenogenetic only in northern populations. Somewhat similar reproductive phenomena involving other North American *Baetis* species suggest that obligatory, thelytokous parthenogenesis is an adaptation to relatively colder environments. The male imago of *B. macdunnoughi* is described for the first time and is similar to *Baetis pygmaeus* (Hagen).

Baetis macdunnoughi Ide has previously been known only from females (Ide, 1937). Suspected thelytokous parthenogenesis was confirmed for Wisconsin populations in laboratory experiments by Bergman and Hilsenhoff (1978). We have recently examined males of *B. macdunnoughi* from southern Indiana and southern Illinois. Of 55 larvae, 22 were males. One adult male was reared and is described below.

Parthenogenesis in this species therefore may be apparently completely developed only in Canadian and Wisconsin populations. Populations in Illinois and Indiana (where the sex ratio appears to be approximately 1:1) are known only from southern unglaciated regions of these states. Reproductive differences between the northern and the possibly older, isolated southern populations are evidently being maintained by this geographic disjunction.

Interestingly, a similar relationship of southern, sexually reproducing populations and northeastern, completely parthenogenetic populations is present in *Baetis hageni* Eaton (Bergman and Hilsenhoff, 1978). *B. hageni* and *B. macdunnoughi* are not closely related, and the similar reproductive phenomenon may be a result of historical population adaptations to climatic or temperature regime differences between northern and southern areas.

An hypothesis that parthenogenesis in certain *Baetis* is related to cold adaptation is supported by the additional observation that *Baetis foemina* McDunnough and *Baetis hudsonicus* Ide are both known only from the

¹Received August 24, 1978.

²Purdue University Agricultural Experiment Station Journal No. 7287.

³Department of Entomology, Purdue University, West Lafayette, IN 47907

⁴Max-Planck-Institut für Limnologie, 232 Plön, Postfach 165, Germany (West)

Canadian Tundra and are both known only as females. Also in some populations of the western *Baetis bicaudatus* Dodds, only females are known (Dodds, 1923), and a correlation with cold mountainous environments may possibly exist.

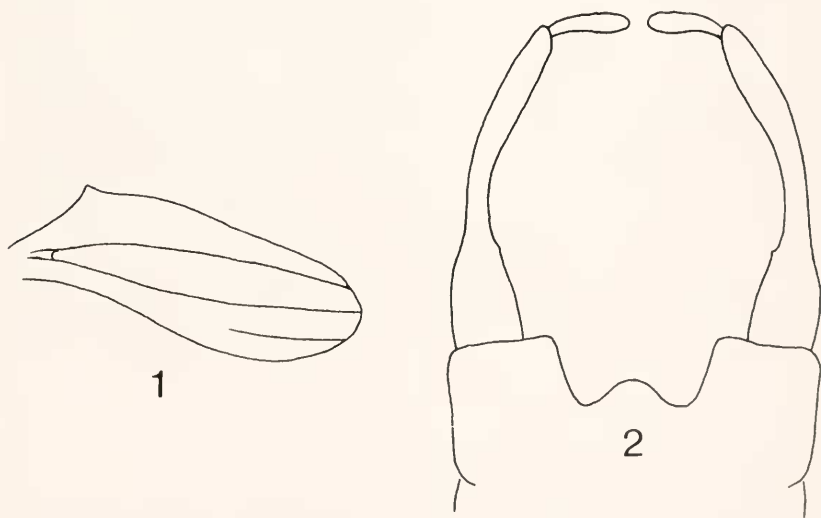
Parthenogenesis is evidently the most selectively favored form of reproduction in relatively colder, or stressed, environments for some species. Mayflies with parthenogenetic potential may therefore be capable of existing in certain environments that they would otherwise be incapable of. A selective advantage for parthenogenesis could result either when populations are too small to insure high frequencies of mate acquisition or when climatic conditions conducive to mating are highly limited or unpredictable.

Known parthenogenesis in six other *Baetis* species in North America and Europe is apparently facultative, deuterotokous, and non-geographic (Degrange, 1960; Bergman and Hilsenhoff, 1978). This type of parthenogenesis may be expected in many mayfly species (McCafferty and Huff, 1974; Huff and McCafferty, 1974).

The following description of the adult male of *B. macdunnoughi* confirms this species' close relationship with *Baetis pygmaeus* (Hagen).

Baetis macdunnoughi Ide

Adult Male — Length of body 3.5 mm, fore wing 3.8 mm, hind wing 0.7 mm. Head brown; antennal flagella paler. Thorax and coxae brown; remaining leg segments translucent, tinted with brown; fore legs with femora and tarsi slightly shorter than tibiae.



Figs. 1 and 2. *Baetis macdunnoughi* adult male. 1. Hind wing. 2. Genitalia, ventral view.

Wings hyaline. Fore wings with marginal intercalaries absent from first interspace. Hind wings (Fig. 1) with prominent, acute costal projection; anterior margin beyond costal projection undulate; 2 longitudinal veins and 1 long intercalary. Abdominal segments 2-6 translucent white, tinted with brown; spiracles faintly pigmented; segments 7-10 opaque, tawny brown, with terga darker than sterna; forceps white, tinted with brown; cerci white. Genitalia in ventral view (Fig. 2) with basal enlargement of forceps conical; elongate portion broad in apical 2/3; terminal segment long and slender, more than 4 times longer than wide.

Material Examined — 1 ♂ imago lab reared, IN: Perry Co., Poison Cr. approx. 5 mi. NW Derby. V-14-1976. A.V. Provonsha, M. Minno. Deposited in the Purdue University Entomological Research Collection.

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